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Research through design and digital humanities in practice: What, how and who in an archive research project.

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Introduction

This paper highlights shared methods, questions and challenges between Research Through Design (RTD) and Digital Humanities (DH) through the discussion of an archival research project. In DH, debates continue e.g. in (Gold, Matthew, 2012) regarding the impact of digital technologies on epistemology, methodology and our professional identities as researchers, scholars, academics and teachers. Our reading of this debate is that there is a tripartite relationship between the kind of work we should call DH (and aspire to produce), the nature of DH knowledge, research and scholarship (particularly regarding the role of artefacts produced) and issues of disciplinary orientation or professional identity. We could phrase these as the what, how and who of DH and, of course, RTD. The discussion of our project is in no sense intended to provide an exclusive answer to those questions, but to give one snapshot of what DH and RTD look like when they come together. We emphasise that this relationship can and will be productive for both disciplines and point to the lack of significant discussion hereto.

Background

Given our research backgrounds in media art practice (Schofield and Whitelaw), interaction design (Kirk, Schofield and Whitelaw) and HCI (Kirk) and acknowledge that we approach the field(s) of DH, as many have before us, from the outside. Our interest in DH (and subsequently in the comparisons we pursue here) was founded through a particular research project described in this paper. It arose in connection with the specific disciplinary concerns of our colleagues in English and in the university library and our adoption of these concerns as part of a design space. Through the eighteen months of the project we found ourselves increasingly looking to DH literature e.g. (Drucker, 2013; Gold, Matthew, 2012; M. G. Kirschenbaum, Ovenden, & Redwine, 2010) to inform and contextualise our research and were inspired by projects similar to ours, defining themselves as wholly or partly within DH. As such it seemed that from the outset our project existed in an ecosystem of others already blending methods from DH and RTD and that there was a demonstrable rationale for examining this relationship with a view to future applications of common or new methodologies. In this paper we emphasise RTD as exemplified by (Bowers, 2012; Frayling, 1994; W. Gaver, 2012; Pierce *et al.*, 2015) in particular over design practice and theory more generally because of its associated methodologies – some of which we adopted in this research – and because we observe a family resemblance between our own research and canonical examples of RTD. In works such as the Prayer Companion (W. Gaver *et al.*, 2010), History Tablecloth (W. Gaver *et al.*, 2006), and the Home Horoscope (W. Gaver, Sengers,

Kerridge, Kaye, & Bowers, 2007) designs were deployed as investigative and sensitizing experiments and we adopted this method in our research. Our further motivation for this paper is that we identify a number of recurrent, common concerns between DH and RTD including the relationship between qualitative and quantitative techniques, the place of artefacts in bearing knowledge, and the articulation of aesthetics and culture through digital means. Both fields have at least a twenty to thirty-year history (or more depending on one's definition) and each is at a moment of existential self examination, with parties on all sides engaged in a debate arguing for a more or less inclusive or exclusive boundary defining DH or RTD and what kind of criticality is or should be employed or created within it (Gold, Matthew, 2012), (Bardzell & Bardzel, 2013), (DiSalvo, Lukens, Lodato, Jenkins, & Kim, 2014). In summary then we saw an existing but relatively under-theorised and under-discussed disciplinary relationship between two disciplinarily distinct fields, each at a time of transformation and self-examination. Our opportunity for exploring this relationship was founded in the practical design work we were doing. This innovative and reflective work drives the discussion throughout this paper.

Research Through Design and Technology

Because of its association with designing for and with new technologies, debates over the direction of RTD spread from the pages of design journals (*Design Issues* in particular) to HCI/Interaction design conference publications such as CHI (SIGCHI Conference: Human Factors in Computing Systems) and DIS (Designing Interactive Systems). Like DH, RTD is strongly engaged with the potentials of new technologies but unlike DH this focus is generally away from scholarship and instead, directed towards their place in culture as located in the home ((Chatting, Kirk, Yurman, & Bichard, 2015; Kirk *et al*., 2010), the workplace (B. Gaver & Martin, 2000) or in the pursuit of entertainment and leisure (REF). At its most speculative it is employed to ask difficult questions about the nature of technological progress as part of broader economic or political contexts. RTD emphasises artefact-led, practice-based research with an emphasis on developing design methods, conceptual frameworks and theories, as well as products (W. Gaver, 2012). Its speculative orientation and emphasis on making with digital materials aligns it well with some currents of thought in DH e.g. (Drucker, 2009). Indeed, Joanna Drucker has pointed to a shared ground with design (in general) noting that, 'all forms of design share a propositional orientation that is well-suited to the challenges that come with designing new structures, for design asks "What if?"' (Burdick, Drucker, Lunenfeld, Presner, & Schnapp, 2012). At the same time she warns that 'The cultural authority of digital technology is still claimed by the fields that design the platforms and protocols on which we work. These are largely fields in which quantitative, engineering, and computational sensibilities prevail.' (Drucker, 2012) We wish to qualify Drucker's claim by noting a series of more detailed concordances with RTD of a particular propositional, speculative and explorative orientation. We note that despite Drucker's valid concerns for the positivist outlook of some design contexts, within the field of Human Computer Interaction and Interaction Design, a vibrant dialogue –

contextualised as RTD – is being sustained concerning the role of designed artefacts in knowledge production (Bowers, 2012) their responsiveness to the values of users (Vines, Clarke, Wright, Mccarthy, & Olivier, 2013) and the state of critique and criticality (Bardzell & Bardzel, 2013). All of these concerns are directly relevant to the digital humanities.

Criticality, Materiality, People, Disciplines

In both DH and RTD we observe a desire to define a relevant role for criticality that is matched with epistemological disagreements over the origins of what the philosophical or theoretical departure point for that criticality should be. These fields share a recognition that the merging of building and criticality precipitate a change in our attitudes to theorising our work. As Ramsay writes:

> ...making a map (with a gis system, say) is an entirely different experience. dh-ers insist — again and again — that this process of creation yields insights that are difficult to acquire otherwise. It's the thing I've been hearing for as I long as I've been in this. People who mark up texts say it, as do those who build software, hack social networks, create visualizations, and pursue the dozens of other forms of haptic engagement that bring dh-ers to the same table. Building is, for us, a new kind of hermeneutic — one that is quite a bit more radical than taking the traditional methods of humanistic inquiry and applying them to digital objects. (Ramsay, 2013)

One trend we identify is a move to identify what are essentially *literary* forms of criticality and suggest ways that could be applied to the design of digital technologies understood as a process of 'writing'. Melanie Feinberg for instance proposes an understanding of finished designs as embodying a kind of 'rhetoric' (Feinberg, 2012), which offers a means of critically understanding interface design. For Feinberg's student designers, considering their design practice as a kind of writing is intended to sensitise them to the values that they implicitly or explicitly embody in their work and by doing so give them a set of critical references to draw on.

The evocation of rhetoric recalls Kirschenbaum's description of the operation of hard disks as itself part of a process of writing, emphasizing the similarity between human and machine forms of inscription. In Kirschenbaum's research, erasure and storage are conceived of as contributing to a wider process of meaning creation (M. Kirschenbaum, 2008). In fact they (also) are conceived of as part of rhetoric. Kirschenbaum describes the materiality of computing storage media as a kind of evidential articulation of argument whose particular 'rhetoric[al]' (M. Kirschenbaum, 2008, p. 8) mode is bound to its material foundations. Electronic literature, according to Kirschenbaum is expressive in ways which are inseparable from its material form but the whole is to be understood according to what are, at heart, literary analogies.

Other authors have suggested that there is a lack of focused critical direction in some work identified as RTD (and critical design more specifically) (Bardzell & Bardzel, 2013). In response, they propose a tighter relationship, in the discussion of RTD artefacts, with critical theory of a particularly *literary* genealogy citing the Frankfurt School and 'semiotics, poststructuralism, feminism, psychoanalysis, and Marxism' (Bardzell & Bardzel, 2013, p. 3300). We, as others have e.g. (Pierce et al., 2015), question its suitability for supporting the practice-based research processes that are often so much a part of both RTD and DH. In our work we wish to exercise a criticality which is more than hermeneutic, more than an 'after the build' reflection on finished designs. Materiality, as a catch-all concept, is attractive to RTD and DH researchers engaged with the building of artefacts because, at its best, it promises a fine grained focus on what we can critically, theoretically, or philosophically say about what we are doing when we make things. It is unsurprising then that a range of practical and theoretical approaches to digital or computational materiality (Drucker, 2013; Jung & Stolterman, 2011; M. Kirschenbaum, 2008; Thrift, 2005; Wiberg, 2013) seem so much in vogue. Some of this will inflect our discussion here of our project work.

Because of the importance of artefacts within RTD the debate over the role of theory and criticism is frequently conflated with a discussion of how knowledge produced in objects eventually finds its audience, academic or otherwise (Pierce, 2014). This is particularly relevant in the context of our project where all of our prototypes, artworks and the final interface design were publicly available and regularly shared with our colleagues in English and in the library and with a group of project participants. Because of these relationships we were concerned with how the designs produced functioned as bearers of knowledge. This interest finds commonality with recent discussion of materiality in DH literature (Drucker, 2013) which examines the complex performative (Austin, 1962; Butler, 1988) role that technology has to play in articulating epistemological positions. So far we have sketched two broad kinds of critical approach – a hermeneutic, literary one contrasted with another focused on materiality. As part of the 'who' of our discussion we will also discuss (aligned with this second focus on materiality) how the shared artefacts of our project became, in some senses, 'boundary objects' (Bowker & Star, 2004; Star, 2010) through which we could understand and negotiate the critical interests of all parties involved. We will note that not only do artefacts articulate a particular kind of knowledge themselves but that their adaptability to different kinds of annotation (Bowers, 2012) makes them especially useful in inter-disciplinary collaboration, particularly as part of an iterative design process.

What

Our project was, typically for Digital Humanities research, based around an archive. Bloodaxe Books is a small but internationally significant publisher of contemporary poetry, whose archive, consisting mostly of edited manuscripts, was purchased by Newcastle

University, UK in 2013. Our role within a research project as artists and interaction designers was to create exploratory and provocative interactions with the archive both online and in physical space. This is the *what* of our project.

The interfaces we designed for the archive respond to its formal and textual specificities and this flexible and responsive mode of engagement is typical of RTD processes. this kind of approach is well aligned with a model of DH as expanding the vision and scope of research processes as well as simply augmenting their methods with new tools and techniques. In our project we began with loose research questions (as described above) that were refined alongside the project. Crucially, we aimed to be responsive not only to the aspirations of the various stakeholders (Bloodaxe Books themselves, our colleagues in English and in the library Special Collections department as well as the community of poets and scholars interested in the archive) but also to the materiality of the archive itself. We conceived of this materiality as consisting not only in the manuscripts and records themselves but also in a broader sense as being embodied in the technical infrastructure, working practices and physical spaces of the university. We were conscious of Star's (1999) rich description of infrastructure as being defined by embeddedness, transparency, being linked with conventions of practices, embodying standards and being visible upon breakdown (among other points).

A defining feature of our project was that it was conducted alongside the cataloguing and digitization of the archive. A full time archivist and full time digital assistant were employed by the library to achieve conduct this activity. The material, the 'what', of our project was consequently a dynamic, developing entity which necessarily put us in close contact with our colleagues in Special Collections as well as their technical support team (ISS) as the catalogue grew and more items were digitised. A point of critical, material interest for us was that the working practices of the archivist and digital assistant, the network infrastructure and its management by ISS, and the cataloguing and digitisation software systems (which were formally and technically separate) were all inextricably linked in a complex and evolving ecology in which we were trying to intervene. Much of our early design work could be described as a form of 'gearing in' (Gurwitsch, 1979), a self-orientating and exploratory activity through which we felt our way through this ecology of materials.

A starting point like this is not uncommon in design processes, but RTD offers a specific set of methodologies intended to facilitate the transition from early questions to specific designs. Among these we identified cultural probes (W. Gaver, Boucher, Pennington, & Walker, 2004) as compatible with our particular circumstances as described below.

How

Our treatment of the archival material was to be informed by the experience of thirty project participants each of whom was conducting personal, creative research in the archive. Inspired by previous research through design work we conceived of a ‘cultural

probes' (W. Gaver *et al*., 2004) activity to gain insight into the way the archive was being used by our project participants and to uncover some of the things they found interesting about the materials themselves, the better to inform our *what*. Cultural probes 'are collections of evocative tasks meant to elicit inspirational responses from people—not comprehensive information about them, but fragmentary clues about their lives and thoughts.' (W. Gaver *et al*., 2004) They have been deployed by others to sensitize designers to the subjective and personal responses of potential users of future technologies. Additionally to the probes activity our colleagues in English conducted a series of unstructured conversations with participants and the transcripts of these also contributed to our approach to the materials.

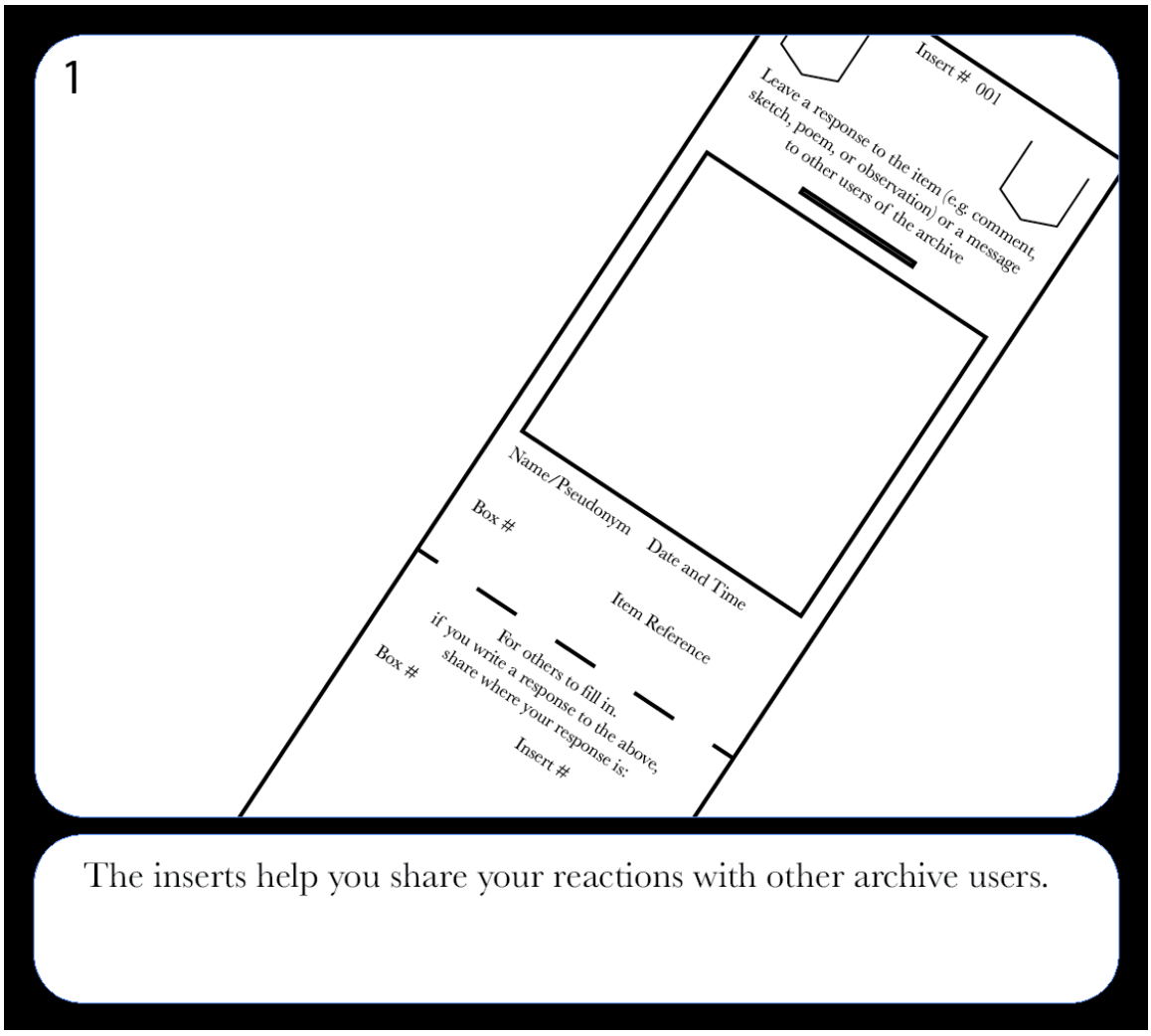

Fig. 1. Detail of Instructions for Cultural Probes

Our cultural probes activity used a bookmark-like insert {see Fig. 1} completed and left by participants in the archive boxes themselves to act as a conversation *backchannel* for participants. A trial of this activity revealed a number of interesting features of the archive that focused our interests and informed future designs. Our later work with archival

marginalia and our related interest in the temporality of the archive was significantly informed by this process. When Drucker asks 'have the humanities had any impact on the digital environment?' (Drucker, 2012) one answer is in exactly this kind of enquiry, which has at least a ten-year history in design research. Cultural probes combine theatrical or performance-oriented, ethnographic and social analyses to inform designs. The probing activity we carried out (inline with an accepted expectation of cultural probes) was user-focused, not in the sense of a formal *requirements* analysis but as a kind of critically sensitizing activity. The production of information for qualitative analysis is posited as a humanistic type of enquiry because it can be approached from a variety of epistemological positions. Our particular analysis of our cultural probes results was from an experiential design perspective but other kinds of reading (e.g. a feminist, post-colonial or Marxist reading) could be applied.

This activity provided a set of emergent themes, which informed our future designs for interaction with the archive. We emphasise that this method is relevant for DH because the probes provided an interfacing activity through which we, as designers, could get some insight into what our participants, many of whom we considered to be domain experts as well as potential users, saw as interesting about the material. many of the participants noted particular features of material interest in the archive materials (such as the presence of marginalia and other notes on manuscripts and even packaging in the archive). Some of the probes richly described the experience of being in the archive and feeling a sense of its short but rich history. Others used the probes to ask questions about the future of the archive and its online interface.

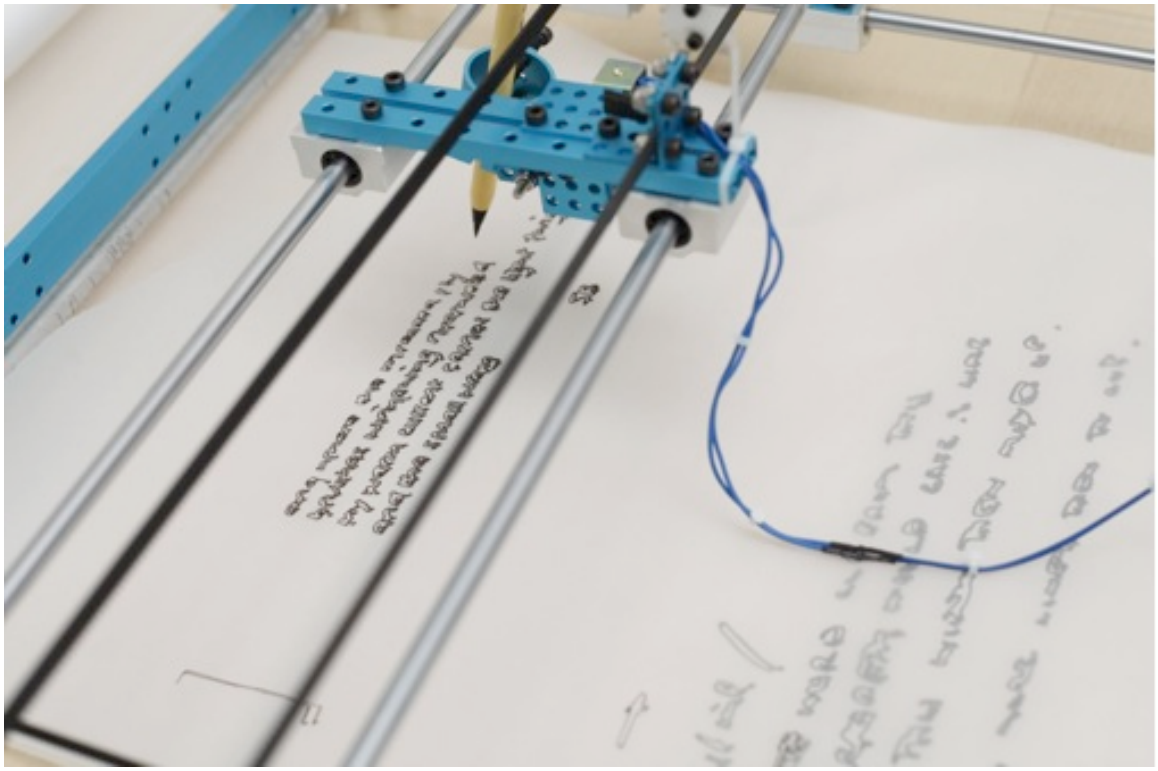

Fig. 2, The Marginalia Machine

One aspect of our design work in particular responded to these emergent themes. The interest in marginalia and in the temporality of the archive contributed to the development of three diverse but inter-connected parts of our design production, all focused around archival marginalia (loosely defined to include other handwritten annotations as well as things actually found in the margins). The *Marginalia Machine* was a drawing machine, a Cartesian or 'XY' plotter which redrew annotations from recently scanned archival manuscripts publicly to a continuous paper scroll {see Fig. 2}. While the *Marginalia Machine* drew a set of recently scanned items, another of our project outputs, a Twitter bot '@BloodaxeArchive' was actually linked directly to the technical infrastructure supporting the digitisation process happening in the library. As new items were scanned by the digital assistant and saved to a networked drive a server script, scanning and rescanning that folder would detect their presence and trigger a set of other scripts culminating in a tweet containing an image of the marginalia {see Fig. 3} and a link to the new item in a work in progress web interface to the manuscripts.

Fig. 3, Screen Grab of Marginalia Tweet

To produce this work, our colleagues in computer science used the API backend to the open source Optical Character Recognition (OCR) engine 'Tesseract' to differentiate printed text from handwriting and other marks producing an image of the latter. We ourselves wrote Python code to tweet the image and produce the link to the interface. The technical process for the Marginalia Machine was similar but rather than tweeting the

resulting image, we vectorised it and sent the resulting coordinate data to a micro-controller which drove the drawing machine. The third and final feature of the design, derived from our interest in marginalia was to produce a marginalia 'layer' over some items in the final iteration of our web interface to the archive. The item-level page for some manuscripts allowed a selection for a marginalia view as well as a zoom/pan viewer {see Fig. 4}. Similarly a search facility on the main interface page offered the opportunity to show thumbnails of marginalia in preference to book cover images or thumbnails of the manuscripts themselves.

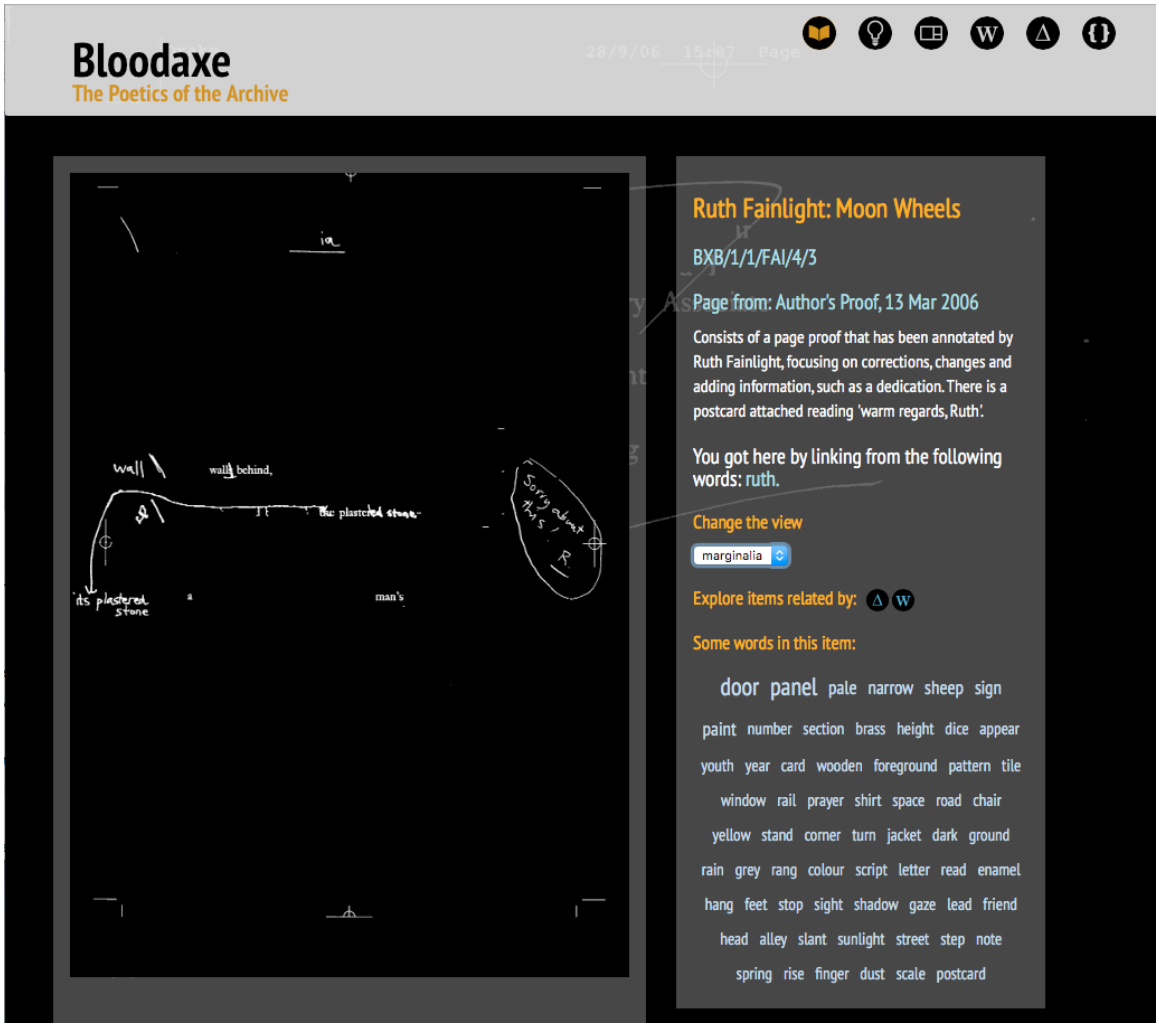

Fig. 4, Screen Grab of the Marginalia View of an Archive Item

The Marginalia Machine, the Twitter bot and the marginalia layer were initially influenced by the responses to our cultural probes exercise, helping us to tighten their focus on archival? materiality. Alongside the production of the former two, we came to consider more and more how our designs might engage with some of the expressed interest in the time of the archive. Part of this sense of time, by our reading, was in the contrast between different phases of the archival life cycle (Schellenberg, 1961). The abrupt transition from an inactive part of the cycle to the cataloguing stage prompted one participant to discuss 'an

aura that's added by the fact that this material has suddenly become a part of history.' We became conscious that we were designing with material that was in a period of transition, and that this feature was a defining part of our design space and a point of interest that could structure both the form of our designs and our interaction with colleagues. In essence we felt that the archive in this state embodied a kind of 'liveness' that we could work with, respond to and expose[1]. In particular, our focus on liveness during the production of the Twitter bot brought us into tight technical and professional correspondence with our colleagues in the library. Technically linking the @BloodaxeArchive tweets to the appearance of new material in the archive required us to negotiate access to network drives that were in daily use by the archivist and digital assistant. To gain this permission we first had to understand the library workflows and the practical and technical details of cataloguing and digitisation. This process brought us into frequent contact with these colleagues and helped cement a friendly working relationship in which we could discuss each others work. For us, early and improvised technical access to the catalogue and digitised material meant that we could produce and release early designs with which to engage our colleagues and project participants with the growing stack of digitised materials. Simultaneously, the archivist and digital assistant saw the materials they were creating appear in the public domain far earlier than would normally be the case. Seeing early iterations of the web interface design afforded them a significantly more active role in discussing the functionality and look of the design than they would otherwise have had. We contend that this kind of interdisciplinary collaboration was actually an almost inevitable consequence of the kind of materially-oriented design process that we were pursuing. Our desire to pursue timely interventions with the material as it was being catalogued was founded in our early dialogue with participants. The effect of these interventions was to produce experimental design work which focused on unsual aspects of the archive.

Other Public Prototypes

Outside the library our approach of releasing designs early and often allowed us to keep our colleagues in English in an ongoing conversation about what was or was not interesting about them and what should or should not be included in the final web-based interface to the archive. We could define these designs as a set of high-fidelity prototypes which developed various aspects of the interaction and graphic design of the site and informed its conceptual underpinnings. In RTD terms these designs have much in common with 'workbooks' as defined by Gaver (2011).Workbooks in an RTD context are sets of early conceptual sketches produced to facilitate 'quasi-participatory' design approaches. Workbooks recognise 'that ideas may develop slowly over time, that important issues and perspectives may emerge from multiple concrete ideas, [...] and that when the provisionality of early ideas is maintained in their expression, design workbooks can support a quasi-participatory design approach as people interpret, react to and elaborate upon the ideas

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[1] We discuss this *live* facet in detail in forthcoming published work.

they present.' (W. Gaver, 2011, p. 1551). Similarly our array of early interface and visualisation designs were intended to draw out various aspects of the materials and what we might do with them in a suggestive way without developing designs too fast or completely. We emphasise this is prototyping of a particular characteristic type that, rather than iterating over a small set of ideas with the express purpose of honing in the most interesting, seeks to pluralise the possibilities and broaden the design space with a view to encouraging collaboration and creativity. We further note that the technical feasibility for producing this kind of prototype for the web has significantly increased over the last five years with the broadening accessibility of resources for online visualisation and interface design such as D3, AngularJS, processingJS, RaphaelJS *etc* the first three of which were all used in our online work.

In our project an early interest from one of our colleagues in the correspondence between items in the Bloodaxe archive itself, and the presence of those authors in other archives or records elsewhere precipitated a series of exchanges culminating in a data visualisation facet of our interface entitled simply *Data*. This particular colleague, another post-doctoral researcher who is also an internationally published poet, was interested to look at the correspondence between externally sourced metadata about authors with the recipients of various literary prizes. We produced several prototypes along these lines and discussing them allowed us to achieve a shared understanding of both the limits of and points of interest in the data. In the released version *Data* combined our own archival metadata with that of the British Library to identify publication trends among Bloodaxe authors. The visualization {see Fig. 5} uses three colours to define three different kinds of publication and arrange them on a timeline, left to right. Orange depicts books by a single author, published by Bloodaxe. Pink is for books of collected poems, by any publisher including a poem (or poems) by the author. Blue is for single authored works where the publisher is not Bloodaxe. Some interesting features are visible with this visualization. For instance a sort by number of books published shows clearly that those authors with the most published volumes have comparatively few published with Bloodaxe. By contrast, scrolling down to those authors with few publications shows a strong correlation between new authors and Bloodaxe.

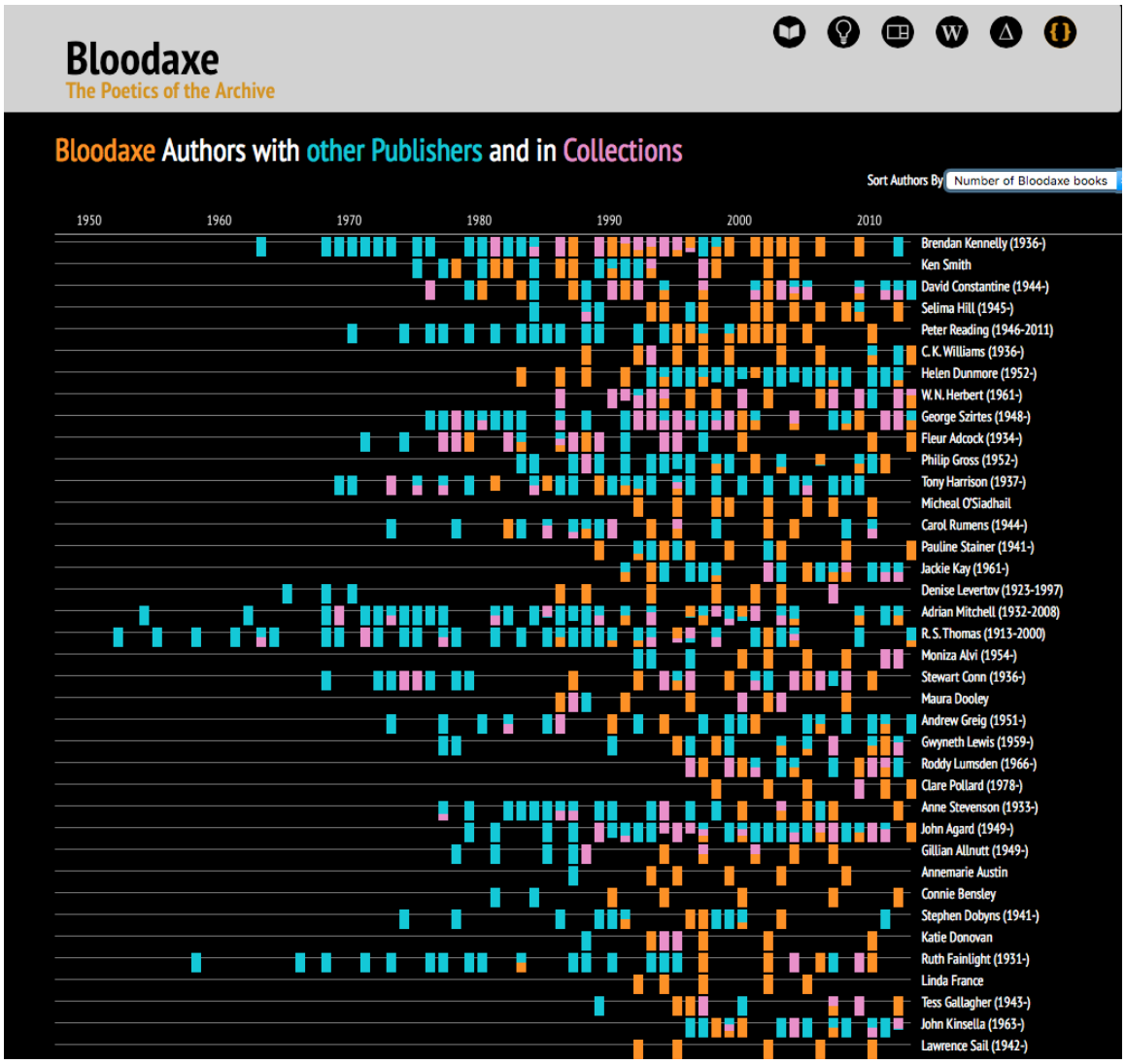

Fig. 5, Screen Grab of the *Data* Facet of the Interface

Separately another facet of our final interface design went through several sketch-like iterations before its final integration into our design. *Shapes* allows users of our interface to sketch – with the mouse – the shape of a poem and receive approximate matches from the archive. Users of the interface can also choose from a set of predefined shapes representing common forms of text on the page in the archive. *Shapes* was partly inspired by the interest of another colleague and leader of our project team, a professor in English, in a published volume of the archive of the poet Emily Dickinson entitled 'The Gorgeous Nothings' (Dickinson, Bervin, Werner, & Howe, 2013). One section in this work was devoted to unusual shapes of various manuscripts and other media within the archive (Dickinson was known for her *folded* poems). From this starting point, a conversation arose about the significance of the form of a poem on the page, not only in terms of number of stanzas, length of line which are more commonly the focus of text mining and digital close reading techniques, but also more intuitively, poems that *look like x*. Beginning with the Java-based prototyping environment 'Processing' we developed a rough prototype that

attempted to produce a generalized description of the shape of a poem. Rather than using the text produced by OCR data, we instead used a basic image processing technique to separate foreground text from background paper. Our technique first of all created a histogram for the brightness values of given manuscript (first converted to grayscale). Identifying the dominant brightness gave us a baseline for a comparison between light and dark shades. Using this we converted the image into a binary version – each pixel was either white or black depending on its proximity to the dominant background brightness. Finally we segmented the entire image into blocks and using an adaptive threshold for the number of black pixels require to colour a block black, produced an image of black or white tiles {see Fig. 6} and a corresponding string of zeros and ones representing this abstraction. This string could then be used to compare to other documents or to a search using Levenshtein distancing[2].

Later our work with shapes was integrated into the final interface design. As with the marginalia layer, we sought to add variety to the core archival interface by using the shapes data to disturb the cataloguing structure. Each manuscript page was given an icon which would link to the shapes page already showing a selection of shape matches for that item and links to their main interface page. In this way we introduced a playful to-and-fro between conventionally laid out catalogue pages and the unusual links we had produced between them.

[2] Levenshtein distance measures the number of deletions, insertions, or substitutions required to transform one string of characters into another.

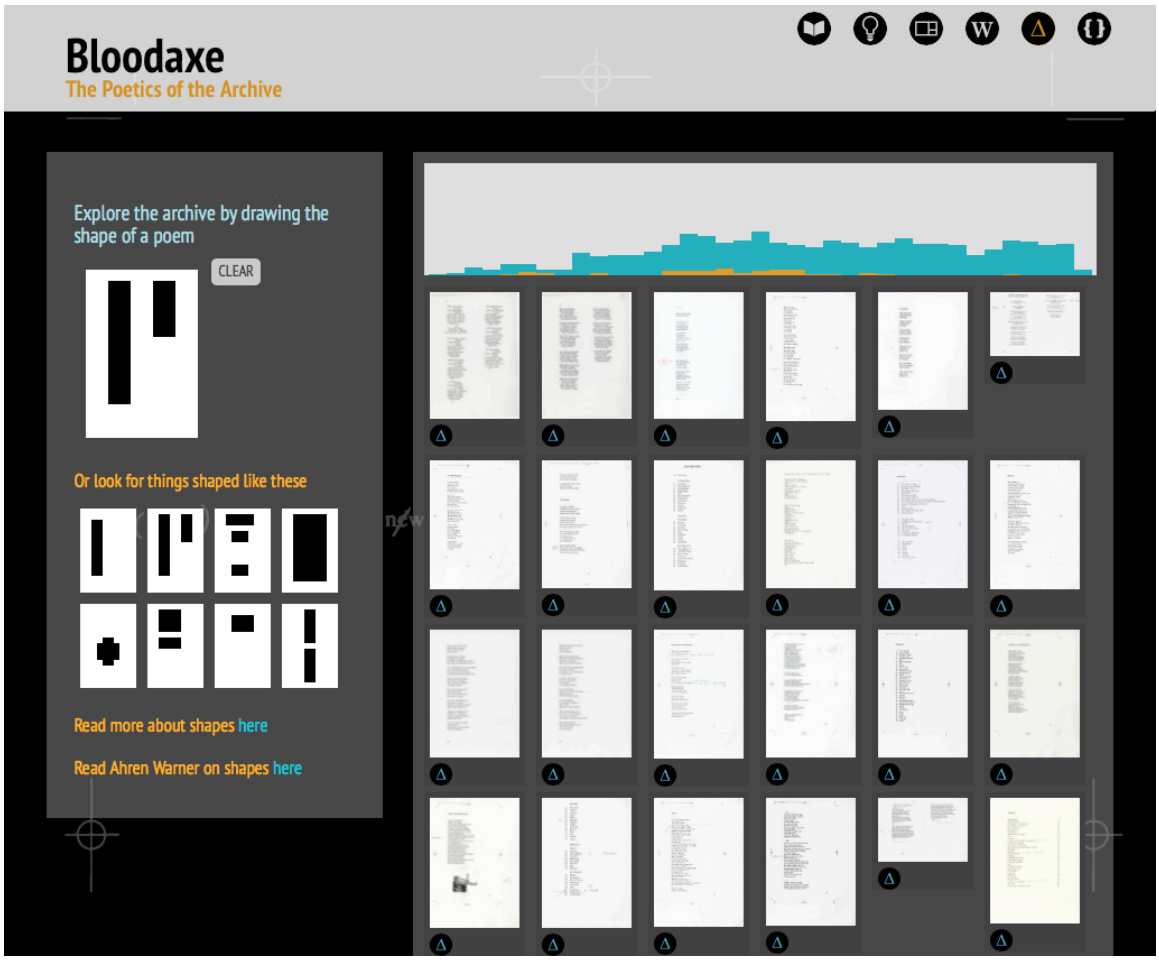

Fig. 6, Screen Grab of The *Shapes* Facet of the Interface

One final aspect of our design continues this trend. *Words* uses text mining techniques and word distancing to produce network graphs of correspondences between documents and relationships to themes (e.g. flowers, death). Force directed graphs like ours {see Fig. 7} have become a commonplace trope that often serves alongside other visualisation facets to illustrate complex inter-relationships. Our adoption of this form however was novel firstly because of its context as a well-integrated part of an archive interface but also because of the data on which it was based and the process through which that data was arrived at.

At an early stage in our project we had an intuition that text-mining techniques to take advantage of the available OCR-recovered text would produce interesting results, particularly at the level of lexis. Poems, we reasoned, by their very nature are likely to contain an atypical set of lexical choices and those choices, if revealed might be employed to convey a small snapshot of a poem at various levels of abstraction in an interface design. Using the Python Natural Language Toolkit (Project NLTK, 2015) (NLTK) we produced a ranked term-frequency vs inverse-document-frequency (TF-IDF) list of words for each

scanned document in the archive. TF-IDF is useful for producing a ranking of significant words for a particular document in comparison to a large corpus. Essentially TF-IDF provides a list of words, which characterise that document as distinct. As such we felt that it was a good option for generating a manuscript *snapshot*. The data produced by our programme confirmed this intuition and we began to integrate these ranked TF-IDF results into our interface in a number of inter-connected ways using an arbitrary cut off point of the top twenty most significant words for each document. First we included a randomized selection of these words as topic 'tags' on our main search page. These could be used as filters to the collection and would also cause items to match searches alongside other metadata items such as item titles, dates, creator names *etc*. In a sense these tags acted as 'previews' which are 'graphic or textual representations of information abstracted from primary information objects' (Greene, Marchionini, Plaisant, & Shneiderman, 2000). We also included a small set of these words alongside thumbnail images of manuscript pages at various levels of the interface including the level for a single printed work.

The gathering of these text-mined words as tags on the main page of our interface led to a further feature. As we explored an early version of our interface featuring these words we began to have a sense that there were emergent themes. For instance, we noticed the names of many flowers or plants, words related to weather and kinds of animal. This was congruent with our hope that our text mining activity might illuminate features of interest in the poems for unfocused exploration as well as focused search. With our colleagues in English we identified a number of informal themes and considered ways of programmatically identifying relationships to them. As an experiment, we applied a word distancing metric (drawn from the Python implementation of WordNet within NLTK) to produce an ordered list of word distance from our theme to every extracted word in the archive. This immediately produced some compelling results and we experimented with various words to obtain a satisfying list of matches. For instance, our top matches for weather included 'wind, snow, rain, storm, gale, scorcher, hail, quiet, downpour, cloud, thrust, heat, drift, smoke'. There are some anomalies 'thrust, quiet, thrust, drift' but more clear hits than misses.

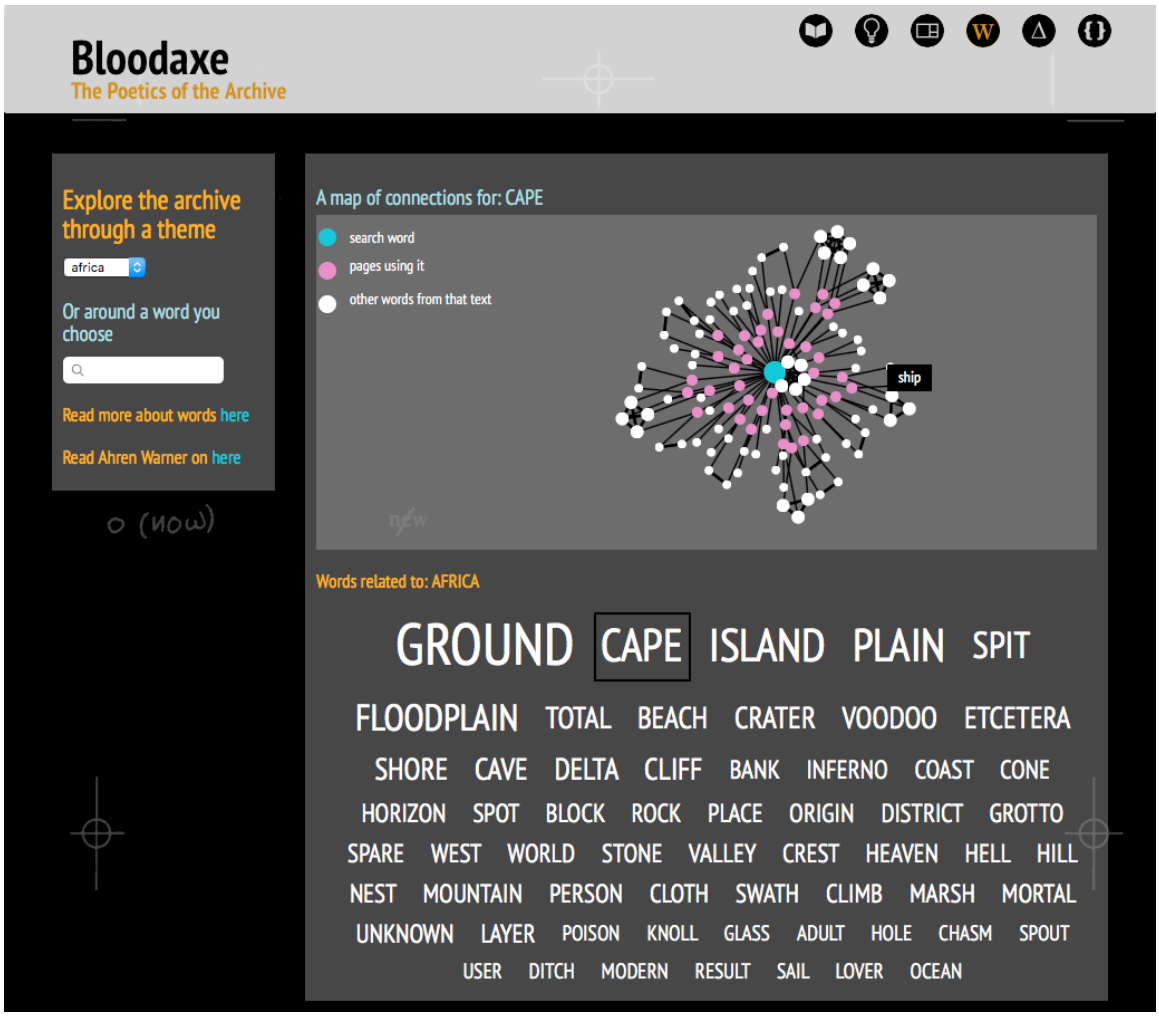

Fig. 7, Screen Grab of The *Words* Facet of the Interface

From these results we envisaged a facet of our future interface focused on relationships between themes, words and manuscripts. In its final form *Words* allows users to select from a set of pre-defined themes and use the resulting matches to centre a force directed graph around one of them. The graph will identify all other documents for which this word is in the top twenty TF-IDF results with documents (identified by pink dots). Also visualised are the top two TF-IDF words for each document and common top words are connected to form clusters. For instance {Fig. 7} shows results from the theme *Africa*. The user has selected *cape* as the centre of the visualisation which has some thirty or so matches from around the archive. Also visible are a number of small clusters of other matching words from those documents with *ship* visible as a tooltip in the image. Clicking on the pink nodes will take the user directly to a document while clicking the white nodes will redirect to a filter on the main catalogue page. Like our work with shapes, the 'Words' interface is also integrated with the main manuscript pages. We have described how each manuscript thumbnail is accompanied by a small selection of text-mined words. Clicking the *Words* icon produces a view like the main *Words* page but with all the top TF-IDF results from that document listed in place of the themed results. Clicking on an individual word (on the

manuscript page) immediately takes the user to a visualisation centred around that word.

This relationship between a core of collection metadata and a set of computationally generated embellishments is a feature of our design and one that we feel is characteristic of designerly engagements with archival items. The Cooper Hewitt museum's excellent online collection interface makes this distinction explicit with the 'experimental' area of their interface (Smithsonian Design Museum, 2015). This section allows extra features to be enabled such generating object timelines or 'Albers boxes', a set of coded concentric rings representing departments, periods and types of objects for easy visual browsing. Like the Cooper Hewitt's work, our interface to the Bloodaxe Archive *weaves through* designerly, experimental facets which focus on the creative possibilities afforded by its home in native web technologies. We point to this model not only in terms of its attractiveness to new and different kinds of users but also as a distinct disciplinary challenge within DH which questions the framing of archives as datasets in service of specific research questions. The mutable and varied presentation of archive materials online proposes them instead as objects of reflection, engagement, collaboration and material for digital makerly practice.

Who

The capacity to build design prototypes like the ones described here relies on a number of factors many of which relate directly to ongoing debate about the kind of people who can or should do DH research. In the discussion that follows we focus on purely on the intersection of RTD practice and DH and our points about professional training and orientation are intended to describe only this space. We recognise that DH is a wide and varied field and our contribution is not necessarily intended to be general. Our suggestion is that the kind of experimental and creative intervention with archival materials may demand or at least imply a particular kind of practitioner.

Both of the authors (Schofield and Whitelaw) who technically produced the designs described in this paper come from mixed educational backgrounds beginning in Fine Art, developing a media art practice and becoming involved with both Digital Humanities and Interaction Design through working with archives and collections. Both have contributed to media art journals and maintain an active critical, technical art practice. This background, we argue has two implications. Firstly, our technical skills have all been learned outside of computer science education, through project-based experience. This has necessarily given us a flexible and adaptable skill set and perhaps most importantly a capacity to be both self-reliant and to use community resources, technical documentation and existing examples to expand that skill set as projects demand. Secondly, as art practitioners we are accustomed to an environment where making processes are commonly discussed in critical terms. To return to our earlier point about the search for an appropriate criticality in both RTD and DH we contextualise our design work here in terms of a larger field of critical material studies. Schofield's PhD thesis for instance centred around developing a framework for

making with computational materiality while Whitelaw has contributions around the both the ontology of computer systems (Whitelaw, Guglielmetti, & Innocent, 2009) and more recently the generative potentiality of cultural collections (Whitelaw, 2015). As design methods come increasingly into a relationship with DH contexts we suggest that backgrounds which bring with them aspects of philosophy and criticality drawn from art, material studies and computation might help focus our mutual concerns over the what, how and who of both RTD and DH.

Conclusions

Through the discussion of our project we hope that we have demonstrated not only common purpose between DH and RTD but some productive ways that they can come together. We point particularly to questions over the disciplinary character of criticality present in both disciplines and note the difficulties in reconciling a critical history based on text and literature with a new makerly orientation in DH and RTD. In the context of our project, one answer we share in common with other interface designers is to vary the scope and purpose of archival interfaces to afford not only focused scholarly interaction with the archive but to introduce aspects of speculation, exploration and play. We further position our design work as engaged with an on-going investigation of the material nature of archive objects as they are digitised conceiving of that materiality as being a hybrid of the documents themselves, the infrastructure and technology supporting the interface and the creative intervention of the designer. Finally we point to the significant future potential of this kind of work at a time when a new attention on exploratory online archival interfaces[3] is evident.

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[3] We point for instance to the warm reception of Tim Sheratt's key note presentation at DH2015.

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